

WHAT IS CLAIMED IS:

1. An engine/pump of a pneumatic type for motor vehicles comprising:

5 - a stator defining one or more radial cylinders, in each of which there is slidably mounted a piston defining in the cylinder a chamber supplied with a gas or air under pressure; and

10 - a rotor in the form of an annular cam, which surrounds the stator and co-operates with a cam-follower roller carried by each piston for transforming the reciprocating movement of the pistons caused by the pressurized fluid into a rotational movement of the annular cam, in the case of operation as engine, or for 15 performing the reverse transformation of a rotation of the annular cam into the reciprocating movement of the pistons, in the case of operation as pump;

20 in which each piston is connected to the structure of the stator by a system of guides, which forces the piston to move maintaining its axis rigorously aligned with the axis of the respective cylinder.

25 2. The pneumatic engine/pump according to Claim 1, wherein the aforesaid guide system associated to each piston comprises at least one connecting rod having a first end, which is articulated to the stator about an axis that is parallel to the axis of said cam-follower roller and passes through the axis of the cylinder, and a yoke or rocker having an intermediate portion pivoted on the second end of said connecting rod, one first end 30 articulated to the piston about the axis of the roller, and the second end engaged by a guide element that forces it to move at least approximately along a rectilinear path perpendicular to the axis of the cylinder.

35 3. The engine/pump according to Claim 2, wherein

said guide element is constituted by a carriage guide device, for example of the pin-slit type.

4. The engine/pump according to Claim 2, wherein  
5 said guide element is constituted by an auxiliary connecting rod, which is set substantially parallel to the axis of the cylinder and has one end hinged to the stator and the opposite end articulated to the aforesaid second end of said yoke or rocker.

10 5. The pneumatic engine/pump according to Claim 2,  
wherein the distances of the axes of articulation of the two ends of said yoke or rocker from the axis of the intermediate fulcrum are the same as one another and are moreover equal to the distance between the axes of articulation of the ends of said connecting rod.

15 6. The engine/pump according to Claim 1, wherein it comprises a plurality of cylinders set radially, e.g., according to a star configuration.

20 7. The engine/pump according to Claim 1, in which different the duration of the "active" stroke from that of the "passive" stroke.

25 8. The engine/pump according to Claim 1, in which the annular cam of the rotor is shaped so as to impart to the reciprocating masses laws of motion which are harmonic or in any case diversified.

9. The engine/pump according to Claim 7, in which the piston is maintained in the position of TDC for a short interval of angle of rotation of the engine shaft.

30 10. The engine/pump according to Claim 1, wherein it comprises a distribution system including:

35 an open/close element, with a neutral position and two end positions in which the chamber of a respective cylinder is in communication with the supply of air or gas under pressure (and, respectively, with the

discharge);

a fluid cylinder having the function of booster, which controls the position of the open/close element; and

5 a pilot solenoid valve, which controls supply of pressurized fluid to said booster cylinder to actuate it in one direction or in the other.

10 11. The engine/pump according to Claim 1, wherein it comprises an electronic control unit, which controls said solenoid valve in a variable way, according to one or more operating parameters of the engine.

12. A motor vehicle, wherein it comprises at least one engine according to one or more of the preceding claims.

15 13. The motor vehicle according to Claim 11, wherein the engine, or each engine, is integrated in a respective wheel of the motor vehicle, the annular cam of the engine being connected to the rim of the wheel.

20 14. A propulsion system for motor vehicles, wherein it comprises one or more engines according to one or more of Claims 1-11.

25 15. A propulsion system according to Claim 14, wherein it comprises one or more tanks of pressurized fluid, for supplying pressurized fluid to said engine, as well as an auxiliary engine, and one or more compressors driven by said auxiliary engine in order to accumulate pressurized fluid within one or more of said tanks.

30 16. A propulsion system according to Claim 15, wherein it comprises: a low-pressure tank, which receives the exhaust fluid from the engine/pump; a first stage of a compressor driven by the auxiliary engine, which takes fluid from the low-pressure tank, compresses it and feeds it to a medium-pressure tank; and a second stage of a compressor, which takes fluid

from the medium-pressure tank, compresses it and feeds it to a high-pressure tank.

17. The propulsion system according to claim 16, wherein the auxiliary engine is located in proximity of  
5 at least one of the medium and high pressure tanks, wherein inside said tanks a foam of expanded material is arranged performing as a heat exchange means, and wherein the fluid is sent to said tanks by deviating means controlled by an electronic control unit.

10 18. The propulsion system according to Claim 16, wherein it comprises a heat exchanger for cooling the fluid set between the first compression stage and the second compression stage, and deviator means for deviating the fluid through said exchanger upon a  
15 command issued by said electronic control unit, according to pre-set parameters.

19. A motor vehicle according to Claim 12, wherein it envisages a single integrated "accelerator-brake" control with rocking pedal, which can be rotated in one  
20 direction to activate the accelerator function and in the opposite direction to activate the brake function, said brake function being obtained by causing the engine to function as brake, with a further activation up to end-of-travel of an emergency brake of a  
25 conventional type, which acts on the non-driving wheels.

20. The motor vehicle according to Claim 12, wherein it comprises a system of tanks formed in the beams of a reticular beam structure, which is  
30 integrated in the flat bottom of the boot of the motor vehicle.

21. The motor vehicle according to Claim 20, wherein at least part of said tanks contains a spongy material.

35 22. The motor vehicle according to Claim 21,

wherein the spongy material is a foam of expanded material with open cells.

23. The motor vehicle according to Claim 20,  
wherein it comprises a high-pressure tank connected,  
5 preferably in a removable way, to the structure of the  
motor vehicle.